ControlWave® Intrinsically Safe Gas Flow Computer (GFC-IS)

The ControlWave® Intrinsically Safe Gas Flow Computer (GFC-IS) is an intrinsically-safe integrated "all in one box" chart replacement. The intrinsically safe features of the ControlWave GFC-IS are designed to prevent sparks or a release of energy that could ignite a hazardous atmosphere. The GFC-IS is UL approved as non-incendive for operation in Class I, Division 1 hazardous areas.

The GFC-IS is delivered in a compact polycarbonate enclosure that has provisions for a display/keypad, DP/P/T transducer assembly, and 6 Volt battery/solar power system. The GFC-IS includes a base API 21.1 flow measurement application program, 2 user-configurable digital inputs (DI) or pulse inputs (PI), a DP/P sensor assembly, an RTD interface, and a shunt regulator for solar panel charging of an internal, lead acid cell battery.

The CPU and I/O boards are located behind a shield in the enclosure and all wiring termination blocks are on a termination panel. You must wire all connections from the terminal panel or from the ISProx board out through a conduit on the right side of the GFC-IS enclosure in order to preserve the integrity of the intrinsically-safe rating.

ControlWave Intrinsically Safe Gas Flow Computer

Hardware

- 32-bit ARM9 platform capable of dual-run flow computing and process automation operations
- Gauge pressure or DP/P sensor assembly can be removed and replaced independently of the electronics
- Precision RTD interface provides accurate temperature measurement
- Low power consumption minimizes costs
- Two serial communication ports
- Base I/O includes 2 DI/PI
- Optional I/O expansion includes 2 DI/DO, 4 DI, 2 DO, 2 High-speed Counter Inputs, and 3 AI (1-5 V)

Application Areas

The GFC-IS is appropriate to all flow computer and chart replacements applications, including:

- Off-shore platforms
- Compressor stations
- Storage facilities
- Transmission metering stations
- Distribution/LDC metering/gate stations

Communications

The GFC-IS has two built-in RS-232 communication ports and one RS-485 port. One RS-232 port (Com 1) is factory wired to the LOI port of the bottom of the GFC-IS enclosure.

Inputs and Outputs

The GFC-IS supports a variety of I/O options. The base unit includes two I/O ports that are user-configurable as digital inputs (DI) or pulse inputs (PI). Additional I/O modules may be added including:

- 2 DI/DO, 4 DI, 2 DO, 2 HSC, and 3 AI
- 2 DI/DO, 4 DI, 2 DO, and 2 HSC
- RTD Input

Display/Keypad

The GFC-IS display is comprised of a four line by twenty character liquid crystal display with adjustable contrast. The display allows you to view and modify variable values and associated status information via an ACCOL3 Function Block. Variables include inputs, process variables, calculated variables, constants, setpoints, tuning parameters, outputs, and alarm state.

You can input data into the GFC-IS via a 2-button or 25-button keypad. Each key on both keypads has a microswitch for positive tactile feedback.

IStran

The IStran is the communications interface that allows the GFC-IS to communicate with devices located outside of the hazardous area. The IStran provides 500 V dc isolation between the two devices, and also allows the GFC-IS to receive power from outside the hazardous location. The IStran allows the GFC-IS to control power to a radio or modem located outside the Division 1 area, and operates at up to 19200 bps.

ISProx

The Intrinsically Safe Proximity Sensor Interface (ISProx) provides an intrinsically safe interface to one or two variable impedance proximity sensors (NAMUR Gap Sensors). The ISProx conditions and converts incoming signals to open drain outputs (DOs) which in turn drive digital inputs (DIs) or high-speed counter inputs (HSCs).

TeleCounter

The TeleCounter is an optional pulse counting device and odometer. The integrated TeleCounter assembly directly mounts to a rotary positive displacement meter, and is mounted to the bottom of the GFC-IS enclosure by a water tight gasket. The TeleCounter can be configured to accept a clockwise or counterclockwise turbine meter shaft rotation with index rates of 1, 5, 10, 100, 1000 CF/Rev or 0.1, 1, 10, 100 M3/Rev.

Firmware/Software Features

ControlWave GFC is pre-programmed to meet API 21.1 requirements for a two-run metering station with networking via BSAP or Modbus. Web-style menu pages are pre-configured for all user operations.

ControlWave Designer is an IEC 61131-3 programming environment that allows you to modify the base application or create a completely customized program. ControlWave Designer includes an extensive library of more than 200 basic IEC 61131-3 functions and function blocks common to many IEC 61131-3 based products.

In addition to the basic functions and function blocks, ControlWave Designer includes the ACCOL III function block library. This library includes over sixty function blocks that are valuable for use in oil & gas and process measurement & control applications. The ACCOL III function block library is designed to take full advantage of the significant features offered by the ControlWave GFC-IS.

Data Integrity

The GFC-IS ensures data integrity, in the event of a communication interruption, by storing critical time-stamped alarm and historical data in the controller memory. This data is then retrieved when communication is restored.

Sensor Assembly

Using the sensor assembly integrated in the instrument package is the easiest implementation for a single meter run; however, the base application program also allows use of external transmitters, with or without the integrated sensor assembly.

Most two-run systems use the integrated sensor assembly for the first run and three 1-5 Volt transmitters for the second run.

Mounting

The GFC-IS can be remotely mounted on a wall, a panel, or a two-inch pipe. It can also be mounted directly on the pipeline by utilizing a manifold block.

Options

The GFC-IS supports the following:

- Integral, Bristol gauge pressure or multivariable (MVT) DP/P sensor assembly and upper range limits.
- Pre-wired bendable RTD assembly.
- Thermowell.
- I/O card, including 2 DI/DO, 4 DI, 2 DO, 2 HSC/DI and, optionally, an additional 3 AI.
- Choice of integral, battery and solar power systems.
- Stainless steel manifold adapters.
- A mounting bracket which affixes to the neck of the housing and allows installation on a wall or 2” pipe.
- RS-232 interface PC cables are available in either 10 Ft. or 25 Ft lengths.
- 6 Volt IS solar panel.

ControlWave GFC-IS

Processor		
Type	32-bit 14 MHz ARM9TDMI RISC Core Processor	
Memory		
Boot Flash	512KB Holds boot/download code and soft switch configuration parameters	
Flash	8MB	
SRAM (External)	2MB battery-backed	
Time Functions		
Clock	Serial real-time clock accurate to 1 second/day at 25 ºC, battery backed	
Communications		
COM1 (this port can only be connected to the LOI port)	Type	RS-232
	Connector	Physical Interface via 3-pin connector, which is internally linked to the circular, Alden connector on the bottom of the enclosure door Tx, Rx, GND with DCD asserted when external cable is plugged in **Note:** Area must be declassified before making a physical connection to the Alden connector.
COM2 (this port can only be connected to an IStran communications port)	Type	RS-232
	Connector	8-pin terminal block Supports RTS, CTS, DTR, DCD and DSR modem control signals RS-232 transceivers are enabled by the port's DTR DCD input remains active even when the port is disabled **Note:** Connections must be routed to IStran located in a non-hazardous area (25 foot maximum length).
COM3 (this port can only be connected to an MVT 3808)	Type	RS-485
	Connector	5-pin terminal block
Surge Suppression	All communication ports are transorb protected to ±15KV ESD	
Inputs/Outputs		
RTD (interface only)	Type	The greater of ± 0.1 °C, or ± 0.1 % of reading
	Conversion Accuracy	The greater of ± 0.1 °C, or ± 0.1 % of reading
	Ambient Temperature Effect	±0.01°C / ºC max
	Long Term Stability at Constant Conditions	±0.25 °C / month max
	Note: RTD probe interchangeability can add ±0.7°C of uncertainty to the measurement.	
Pulse/Discrete Inputs	Quantity	2
	Type	Non-interrupting inputs
	Maximum Scan Rate	Once per second
	Input Filter	20 microseconds

Pulse/Discrete Inputs (continued)	Input Current	200 μA nominal at 3.3V per input
	Voltage Range	Internally sourced dry contact input - 3.3 Vdc
	On-State Voltage	>1.86 V
	Off-State Voltage	<1.5 V
	Surge Suppression	16 V transorb between signal ground Meets ANSI/IEEE C37.90-1978
	Pulse Input	Frequency Range 0-10 kHz
		Accumulator 16-bit
Digital Inputs	Quantity	6 total: 4 DI and 2 selectable DI or DO **Note:** Total DI points plus DO points cannot exceed eight
	Type	Dry contact
	Maximum Scan Rate	Once per 250 ms
	Input Filter	15 ms
	Input Current for DI points 1 – 4 (those that are DI-only)	Configurable as 60 μA for low power applications or 2 mA nominal at 3.3V per input
	Input Current for DI points 5 – 6 (those that are selectable as DI or DO)	Configurable as 200 μA for low power applications or 2.2 mA nominal at 3.3V per input
	On-State Voltage	>1.6 V
	Off-State Voltage	<1.3 V
	Isolation	None
	Surge Suppression	30V transorb between signal and ground Meets ANSI/IEEE C37.90-1978
Digital Outputs	Quantity	4 total; 2 DO and 2 selectable DI or DO **Note:** Total DI points plus DO points cannot exceed eight
	Type	Open Drain MOSFET
	Maximum Scan Rate	Once per 250 ms
	Operating Voltage Range	10 Vdc
	Maximum Load Current	250 mA
	Isolation	None
	Surge Suppression	30V transorb between signal and ground. Meets ANSI/IEEE C37.90-1978.

Counter Inputs	Quantity	2; also operable as DI points
	Type	Dry contact
	Frequency Range	Low-Speed 0 – 300 Hz
		High-Speed 0 – 10 kHz
	Input Range	Internally sourced dry contact input
	Input Current	200 μA
	Input Filtering	1 ms or 20 μs
	Accumulator	16- bit
	Maximum Scan Rate	Once per 250 ms
	Signal Conditioning	Switch selectable high and low speed input
	On-State Voltage	> 1.86 V
	Off-State Voltage	< 1.5 V nominal
	Isolation	None
	Surge Suppression	30 V transorb between signal and ground Meets ANSI/IEEE C37.90- 1978
Analog Inputs (optional)	Quantity	3
	Type	Externally sourced, single–ended inputs, 1–5 V dc
	Resolution	14-bit
	Input Impedance	1 MΩ
	Input Filtering	12 Hz
	Maximum Scan Rate	Once per 250 ms
	Channel Settling Time	600 ms to be within 0.01% of input signal
	Input Accuracy	0.1% of span at 25 ˚C 0.2% of span at 40 ˚C to 70 ˚C
	Surge Suppression	30 V transorb between signal and ground Meets ANSI/IEEE C37.90- 1978
Power		
Consumption	Base Unit	6 V dc: 10 mA
Input Voltage Range	5 V dc to 8.28 Vdc	
Fuses	1.5 A from charge regulator, 0.125 A for battery input	
Surge Suppression	16 V dc transorb between signal and ground Meets ANSI/IEEE C37.90- 1978	
Charge Regulator	Temperature-compensated charge control with cut-off	
Threshold voltage for shunt at 23ºC	7.2 V for a 6 V battery	
Backup Battery	Backs up real-time clock and SRAM 300 mA-hour lithium coin cell, 9000 hour expected backup time	
Power Consumption (keypad)	2.5 mA @ 3.3 V (0.008 watts)	

Physical		
Dimensions	Housing	15.77" H x 7.8" W x 9" D
	Clearance	Please allow at least 2.5" space underneath for cabling
	MVT Assembly (optional)	3" H x 3.75" W x 2.5" D
	Mounting	Can be pipe-mounted, wall-mounted, or direct-mounted (in the last case, Emerson recommends PGI Direct Mount manifold products); a kit for affixing to a 2" pipe or mast is available.
Sensor	Diaphragm Material	316 Stainless Steel
	Fill Medium	DC 200 Silicone
	Flange Material	316 Stainless Steel
	Flange Bolt Material DP Units	316 Stainless Steel
	Flange Process Connections	¼" NPT female
Keypad / Display	4-line by 20-character backlit liquid crystal display with adjustable contrast	
	2-button or 25-button keypad with membrane keys with tactile feedback	
	Self-adhesive overlay mounts to the enclosure door or panel (ControlWave GFC package is delivered with this assembly installed on the door)	
	Configuration via ACCOL III Function Block	
	Dimensions	7.4"H x 5.5"W (18.8cm x 14.4cm)
	Window size	1.1" H x 3.1"W (2.8cm x 7.9cm)
	Character size	4mm H x 3mm W
Wiring	Up to 16 gauge wire size at the terminal block	
Weight	Minimum	10 lbs
	Battery + MVT Assembly	18.5 lbs
	Maximum with Radio	20 lbs
Environmental		
Operating Temp	Externally Powered	-40 to 70ºC (-40 to 158ºF)
	With Lead Acid Batteries	-20 to 60ºC (-4 to 140ºF)
Storage Temp	-40 to 85ºC (-40 to 185ºF)	
Operating Humidity:	10 to 95% RH non-condensing	
Immunity	In conformity with ENV 50140 Radio-frequency electromagnetic field amplitude modulated EMC	
Electro-Static Discharge	Meets IEC EN 61000-4-2, EN 61326	
Radiated Emissions	EN 55011:1998 Class A ITE emissions requirements (EU); ICES-003 Issue 3 Class A Digital Apparatus emissions requirements (Canada); AS/NZS3548:1995/ CISPR Class A ITE emissions requirements (Australia). EN 6100-4-3.	
Vibration	Maintains proper operation while subjected to a 2.0g acceleration over 10- 150 Hz and 1.0 g acceleration over 150-2000 Hz (ISA Process Mount).	
NEMA Rating	Nema 3R (Nema 4x except with a battery vent)	

Approvals	
Product Markings for Hazardous Locations (USA):	Class I Div. 1, Groups C & D T3C

© 2009–2011 Remote Automation Solutions, division of Emerson Process Management. All rights reserved.

Bristol, Inc., Bristol Canada, BBI SA de CV and Emerson Process Management Ltd, Remote Automation Solutions division (UK), are wholly owned subsidiaries of Emerson Electric Co. doing business as Remote Automation Solutions, a division of Emerson Process Management. FloBoss, ROCLINK, Bristol, Bristol Babcock, ControlWave, TeleFlow and Helicoid are trademarks of Remote Automation Solutions. AMS, PlantWeb and the PlantWeb logo are marks of Emerson Electric Co. The Emerson logo is a trademark and service mark of the Emerson Electric Co. All other marks are property of their respective owners.

The contents of this publication are presented for informational purposes only. While every effort has been made to ensure informational accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. Remote Automation Solutions reserves the right to modify or improve the designs or specifications of such products at any time without notice. All sales are governed by Remote Automation Solutions' terms and conditions which are available upon request. Remote Automation Solutions does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Remote Automation Solutions product remains solely with the purchaser and end-user.

Emerson Process Management
Remote Automation Solutions
11100 Brittmoore Park Drive
Houston, TX 77041 U.S.A.
T +1 713 827 6380
www.EmersonProcess.com/Remote